ON THE OCCURRENCE OF HENDERSONIA IN CRAWFORD COUNTY, WISCONSIN

BY J. P. E. MORRISON

It was my good fortune to be able to make a collecting trip to southwestern Wisconsin during the spring of 1928 and again in the fall of the same year. Both trips were made possible through the courtesy of Mr. A. C. Himley, of Madison, who accompanied me.

The region of southwestern Wisconsin includes the so-called Driftless Area, where it is believed that many species may have escaped extinction in this part of the country, and have had centers of dispersal, after the last glacier sheet disappeared. Crawford County, Wis., is very nearly in the center of this non-glaciated area.

A very restricted portion of the country around Soldier's Grove was studied. Soldier's Grove is in the northeast corner of the county. The aspect of the valleys and the uplands is that of typical non-glaciated country, with many abrupt slopes, and with regularly narrow valleys, even those of the smallest streams being very regular from head to mouth. The outliers left by erosion in the larger valleys, such as in the valley of the Kickapoo River, often show a regularly conical shape. The rock strata outcrop in many places, and show a very marked development of talus slopes at the bases of the steeper sides of the ravines. The rocks seen outcropping here are limestone in all cases. On every hand the slabs of limestone form a portion of the forest floor, where there is still forest remaining.

The forests that remain are all second growth, where the land has been cut over, and later allowed to return to brush and trees. Most of the upland forest has been removed, and this portion of the country in the immediate vicinity of Soldier's Grove is almost entirely under cultivation or pasturage. The lowlands are in part under cultivation, but a good portion of them is not used because of the difficulties of overcoming the flooding of the lower flood-plain areas.

Quite by chance, on the first trip, a single specimen of a snail new to us was seen, and then in another spot a whole series of specimens was encountered. At once it was recognized as the rare *Hendersonia occulta rubella* (Green), a species formerly. Accordingly, further search was made for the species, in order to determine the extent of its occurence. The second trip was made to obtain additional specimens and to determine the seasonal activity of the animal.

The list of species found at each station follows. The stations are arranged as a series, from the wettest to the dryest habitats.

Station I. Floodplain of the Kickapoo River, near the mouth of Trout Creek. Snails were found dead in the drift and alive under drift logs and in the finer portions of the drift. The river is rather deep, with high banks, and most of the drift is found a small distance away from the river, where the floodplain is wider. Species:

Polygyra monodon fraterna (Say)
Pyramidula alternata (Say)
Agriolimax campestris (Binn.)
Succinea ovalis Say
Succinea retusa Lea
Succinea avara Say
Zonitoides arboreus (Say)
Gonyodiscus cronkhitei anthonyi Pils.
Pomatiopsis lapidaria (Say)

The preceding species were taken alive.

Stagnicola exilis (Lea)
Helisoma trivolvis (Say)
Planorbula armigera (Say)
Stagnicola caperata (Say)
Fossaria parva (Lea)
Physella gyrina elliptica (Lea
Gyraulus parvus (Say)
Campeloma rufum (Hald.)
Musculium truncatum (Linsley)
Helicodiscus parallelus (Say)

These were found dead in the drift.

Station II. The lower portion of the floodplain of Trout Creek that is subject to overflow. Not very much drift is found here; the soil shows a layer of very fine silt as a result of its flooding. Snails were found under logs and in the scanty leaf mold. Species:

Polygyra monodon fraterna (Say)
Pyramidula alternata (Say)
Gonyodiscus cronkhitei anthonyi Pils.
Helicodiscus parallelus (Say)
Vallonia pulchella (Mull.)
Vitrea hammonis (Strom.)
Agriolimax campestris (Binn.)
Succinea ovalis Say

Station III. That portion of the floodplain of Trout Creek that is above the reach of ordinary high waters. This station includes the very mesophytic slopes of the sides of the creek valley that are rather heavily overgrown with brush and small trees. The snails were found under small logs (not drift logs) and in the leaf mold. Species:

Polygyra hirsuta (Say)
Polygyra monodon fraterna (Say)
Polygyra clausa (Say)
Polygyra profunda (Say)
Vallonia costata (Mull.)
Strobilops affinis Pils.
Gastrocopta contracta (Say)
Cochlicopa lubrica (Mull.)
Zonitoides limatulus (Ward)
Euconulus fulvus (Drap.)
Vitrea indentata (Say)
Pyramidula alternata (Say)
Gonyodiscus cronkhitei anthonyi Pils.
Helicodiscus parallelus (Say)
Agriolimax campestris (Binn.)
Pallifera dorsalis (Binn.) ? Immature
Succinea ovalis Say
Succinea avara Say
Carychium exile (Lea)
Pomatiopsis lapidaria (Say)
Hendersonia occulta rubella (Green)

Station IV. Wooded portions of the ravines that branch off Trout Creek Valley; the exposure of the slopes studied (on the Himley Farm) was mostly to the northeast. The ravine studied in detail is about one mile up from the mouth of Trout Creek, and nearly two miles out of town. Species:

Polygyra profunda (Say)
Polygyra monodon fraterna (Say)
Polygyra thyroides (Say)
Pyramidula alternata (Say)
Helicodiscus parallelus (Say)
Vitrea hammonis (Strom.)
Euconulus fulvus (Drap.)
Strobilops affinis Pils.
Carychium exile (Lea)

Gonyodiscus cronkhitei anthonyi Pils.
Hendersonia occulta rubella (Green)

Station V. Slopes of northern exposure in the valley of the Kickapoo. These were studied on Asper Heims Hill, which is an outlier, just to the west of the town. The slope here is very steep, and heavily wooded, with a good many fallen logs. Snails were collected from the leaf mold and from under the logs, which were mostly in stage three of decay, with the inner, heart-wood still solid. Species:

Polygyra profunda (Say)
Polygyra monodon fraterna (Say)
Pyramidula alternata (Say)
Helicodiscus parallelus (Say)
Zonitoides limatulus (Ward)
Strobilops affinis Pils.
Gastrocopta contracta (Say)
Hendersonia occulta rubella (Green)

Station VI. Smaller ravines branching directly off the valley of the river. These ravines have no permanent streams in them; they are covered with rather open woods and brush. The exposure is to the north. Snails were found under logs, under rocks, and in the rather dry and loose leaf mold. Species:

Pyramidula alternata (Say)
Euconulus fulvus (Drap.)
Vitrea hammonis (Strom.)
Strobilops affinis Pils.
Gastrocopta armifera (Say)
Gastrocopta contracta (Say)
Gastrocopta pentodon (Say)
Cochlicopa lubrica (Mull.)
Carychium exile (Lea.)
Philomycus caroliniensis (Bosc.)

Station VII. Slopes of southern exposure in the valley of the Kickapoo. These also were studied on Asper Heims Hill. This portion of the hill is under pasturage, and represents perhaps the most unfavorable habitat for snails, of all. The ground is bare except for grass and a few small herbs; there are many flat limestone rocks, under which the snails were found. Species:

Gastrocopta armifera (Say)
Pupoides marginatus (Say)
Helicodiscus parallelus (Say)
Zonitoides arboreus (Say)
Vallonia pulchella (Mull.)
Agriolimax campestris (Binn.)
Succinea avara Say

In summary it may be said:

1. That *Hendersonia occulta rubella* (Green) occurs, living, at Soldier's Grove, Crawford Co., Wisconsin.

2. That at this locality it is restricted to the region above the high water mark of the floodplains, and below the upland. Here it is most abundant just above the reach of flood waters, becoming less common as the uplands are approached.

Since nearly all the records of the occurrence of this species as a modern form are from the Driftless Area of southwestern Wisconsin, northeastern Iowa, and southeastern Minnesota and from the Appalachians, these two regions must be considered the regions of survival of the species.

Conversely, it is the author's belief that further search will show the species more or less uniformly distributed over the non-glaciated area mentioned.

For previous records of this species, see Shimek's paper (Proc. Davenport Acad. Sci. 9:173).

The specimens of *Hendersonia* described as having been collected at this locality are in the collection of the writer, with duplicates deposited in the museum of the Acad. of Nat. Sci. of Philadelphia, and in the museum of the University of Wisconsin (UW No. 4776), at Madison.

FACTORS IN THE EVOLUTION OF THE PROSOBRANCHIATE MOLLUSC, THAIS LAPILLUS

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The aim of this paper is not to set forth the degrees of evolution in the mollusc, *Thais lapillus*, but to call attention to an apparent process of this phenomenon, *viz., variation.* Also, to indicate, at least, some of the environmental factors, probably responsible for the divergence and maintenance of the apparent physical conditions of these animals.